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**BRIEF REPORT**

# Associations between recalled use of legal UK youth gambling products and adult disordered gambling

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**ABSTRACT**

**Background and aims:** The UK allows a number of gambling products to be legally used by people under the age of 18. The aim of this study was to explore associations between recalled legal usage of five youth gambling products and adult disordered gambling. **Methods:** A retrospective cross-sectional study of 1,057 adult UK gamblers, aged 18–40. Recalled legal use of five youth gambling products (category D fruit machines, coin push machines, crane grab machines, the National Lottery, and National Lottery scratchcards) was correlated with adult disordered gambling symptoms as measured by the Problem Gambling Severity Index (PGSI). **Results:** Recalled rates of legal engagement with each product ranged from 50.9% for Category D fruit machines to 96.6% for coin push machines. For category D fruit machines, the National Lottery, and National Lottery scratchcards, merely having legally engaged with these products as a child was associated with adult disordered gambling. Furthermore, higher levels of recalled legal youth usage with each of the five products was also associated with adult disordered gambling. **Discussion and conclusions:** These results relate to recent government proposals to increase the National Lottery scratchcard legal age to 18, and add to a wider literature on youth gambling and subsequent gambling-related harm.

**KEYWORDS**

underage gambling, gambling policy, gambling legislation, problem gambling, legal age

**INTRODUCTION**

Gambling researchers have raised a number of concerns around children and gambling, including childhood exposure to marketing (Djohari, Weston, Cassidy, Wemyss, & Thomas, 2019; Pitt, Thomas, Bestman, Daube, & Derevensky, 2017; Smith, Chambers, Abbott, & Signal, 2019), high adolescent disordered gambling prevalence rates (Delfabbro, King, & Derevensky, 2016), associations between adolescent gambling and drug and alcohol use (Molinaro et al., 2018), and the age of gambling onset and subsequent adult gambling (Kessler et al., 2008; Sharman, Murphy, Turner, & Roberts, 2019). Much childhood gambling occurs on emerging gambling forms such as in video games that are not currently regulated as gambling products (Wardle, 2019; Zendle, Meyer, & Over, 2019), or occurs illegally (Pugh & Webley, 2000). However, the UK has for a number of years allowed a number of gambling products to be used legally by people under the age of 18, a position that UK policymakers

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have been asked to reconsider (Orford, 2019). The present paper sets out to explore associations between recalled (retrospective) legal youth gambling and adult disordered gambling symptoms amongst a group of adult UK gamblers.

The UK has some electronic gambling machines, known as 'category D fruit machines' that can be legally gambled on by people of any age (Fisher, 1991; UK Government, 2007). Since 2007 these machines have come with a maximum bet of £0.10 per spin and a maximum payout of £5.00 (UK Government, 2007). Category D fruit machines are primarily located in amusement centres and seaside resorts (White & Frost, 2019). Prior to 2007, category D fruit machines had a maximum bet size of £0.30 (UK Government, 2007), and could be found in a wider range of locations, such as chip shops and cafeterias (White & Frost, 2019). By comparison, other categories of fruit machines come with higher maximum bet sizes and payouts, can be found in a wider range of locations (e.g. adult gambling centres) and are not legal for children to use (UK Government, 2007).

'Coin push' and 'crane grab' machines can also be legally used at any age. With a coin push machine, coins (often 2p pieces but coins up to 10p in value are allowed) are inserted into a mechanical device with moving platforms that contains many other coins. Coins are inserted by the user in the hope that the inserted coin will 'push' a number of other coins off a ledge which can then be collected as winnings. Crane grab machines cost up to £1 to play, and involve trying to pick up a plush toy or other prize and moving it into a collection tray by operating a crane machine. The crane will frequently drop the user's item before it reaches the collection tray, similar to the slot machine 'near-miss' effect (Schüll, 2012). However, crane grab machines do differ from the other youth gambling products in that they do not yield monetary winnings.

The UK currently has two state-sponsored gambling products that can be legally used from the age of 16 onwards. The National Lottery was introduced in 1994 and, subsequently, National Lottery scratchcards in 1995. The UK government announced in 2019 that it was considering raising the legal age on scratchcards to 18 (DCMS, 2019), but without any similar plans to increase the National Lottery's legal age.

The authors are only aware of one previous attempt to explore associations between recalled rates of legal youth gambling engagement and adult disordered gambling (Newall, Russell, Sharman, & Walasek, 2020). That study found that higher rates of recalled usage for each product were associated with adult disordered gambling. However, that study recruited UK nationals in general, so would have likely included participants who were exposed to other gambling environments as children. Additionally, Category D fruit machines are a unique gambling product, the regulation of which was significantly altered in 2007 (White & Frost, 2019), a fact that that previous study did not flag to participants. The present results reflect a replication of that study (no participants took part in both studies) with the following design improvements. All participants reported here were born in the UK (in addition to being current UK

nationals), and the description for category D fruit machines was improved to reflect recent expert testimony (White & Frost, 2019).

The present research was designed to explore associations between current adult disordered gambling and recalled legal childhood usage of these five gambling products. This was investigated by testing the following hypotheses:

1. Is having recalled engaging with a legal youth gambling product at all (versus never having engaged with that product) associated with increased risk of adult disordered gambling?
2. Are increased levels of recalled usage of a legal youth gambling (amongst those who have engaged with a product) associated with increased risk of adult disordered gambling?

## METHOD

A preregistered analysis document, results, and materials are available from <https://osf.io/gw8hz/>. Data collection occurred over the 7th April 2020.

### Participants

Adult UK gamblers, who were both current UK nationals and who were born in the UK, were recruited via the crowdsourcing platform Prolific Academic ( $n = 1,057$ ). Although a sample size of 1,000 was planned in the pre-registration document, we collected a slightly higher number in case some proportion of participants' data was incomplete. Participants were paid £0.50 and took just under 3 minutes on average to complete the task (£10/per-hour pro-rata). Participants had earlier indicated to Prolific that they had engaged in one of the following online gambling games before: baccarat, blackjack, bingo, craps, lottery, poker, race and sports book, roulette, slots, video poker, or virtual sports betting.

Participant age was limited to be between 18 and 40 ( $M = 29.3$ ,  $SD = 6.0$ ). Age was limited to 40 because National Lottery scratchcards were introduced in 1995, so this meant that every participant could have legally used each product while they were under the age of 18. Three additional participants' responses were dropped before analysis for self-reporting an age greater than 40.

Table 1 provides participant demographics. The sample achieved a good spread of disordered gambling status, with 7.6% of the sample classified as a current problem gambler by the Problem Gambling Severity Index (PGSI).

### Design and materials

The study used a cross-sectional design. Participants completed three blocks in random order: recalled usage of legal youth gambling products, answering the PGSI (Ferris & Wynne, 2001), and providing demographics. Order of presentation of the five legal youth gambling products was also randomized within that block. Legal youth gambling



Table 1. Participant demographics

Demographic	%	n
<i>Gender</i>		
Female	60.4	638
Male	39.2	414
Other/I'd prefer not to say	0.5	5
<i>Occupation</i>		
In work	72.7	768
Student	15.1	160
Unemployed	6.0	63
Homemaker	4.7	50
Other	1.5	16
<i>Highest level of education</i>		
Primary school	0.2	2
Secondary school	9.8	104
College (A-Levels or equivalent)	35.1	371
Undergraduate degree	40.3	426
Postgraduate degree	14.6	154
<i>Problem Gambling Severity Index category</i>		
Non-problem gambler	42.6	450
Low-risk gambler	29.6	313
Moderate-risk gambler	20.2	214
Problem gambler	7.6	80

products were presented separately, with a relevant photo and between 70–135 words of descriptive text. Task materials are available from <https://osf.io/gw8hz/>.

The study asked for recalled legal youth usage of each product, which for the lottery and scratchcards was between the ages of 16–17, and was under the age of 18 for the other three products. Exact wordings used were, 'How often do you recall using category D fruit machines/coin push machines/crane grab machines while being under the age of 18?', and, 'How often do you recall buying National Lottery tickets/National Lottery scratchcards while being between the ages of 16 and 17?' These slight differences were highlighted to participants with the text displayed from 'while' onwards in each question being displayed in bold font. Recalled usage was measured on a five-point scale for each product, labelled as: Never, Rarely, Occasionally, Frequently, Very frequently.

## Data analysis

Never is qualitatively different from the other four potential responses on this scale. The scale was therefore split into two separate analyses, looking at the separate factors of engagement versus non-engagement (hypothesis 1), and levels of recalled usage amongst those who had engaged (hypothesis 2).

The study was preregistered to use an alpha of 0.01 and to proceed via general linear models, using a separate model for each hypothesis and each product.

## Ethics

The study procedures were carried out in accordance with the Declaration of Helsinki. The Institutional Review Board of the University of Warwick approved the study. All subjects were informed about the study, and all provided informed consent.

## RESULTS

The products with the highest recalled usage were coin push (96.6%) and crane grab (93.8%) machines. The National Lottery (71.6%) and National Lottery scratchcards (68.5%) also had high recalled usage. Category D fruit machines (50.9%) were recalled being used the least frequently. A full breakdown of recalled usage is in Table 2.

PGSI was positively skewed and so a log correction was applied to PGSI. Engagement versus non-engagement was not investigated for coin push machines, because over 95% of the sample reported recalled engagement with this form, leading to heavily unbalanced groups. Recalled engagement with category D fruit machines, the National Lottery, and National Lottery scratchcards was associated with an increased risk of adult disordered gambling, as shown in Table 3. Out of the products tested, only recalled engagement with crane grab machines was not associated with increased risk of adult disordered gambling. An exploratory effect size investigation was performed by calculating semi-partial squared correlations between the engagement variables and (log+1) PGSI. Category D fruit machines had the highest association with adult disordered gambling ( $sr^2 = 0.021$ ), followed by scratchcards ( $sr^2 = 0.006$ ). All other products had  $sr^2$ 's of 0.001 or less. These results are available from <https://osf.io/gw8hz/>.

Higher levels of recalled usage of each product was associated with an increased risk of adult disordered gambling, with each *P*-value being below 0.01, as shown in Table 3.

These were simple linear regressions. Further exploratory analysis adding age as a covariate led to a similar pattern of results, with none of the significant associations altered (results available from <https://osf.io/gw8hz/>).

Table 2. Recalled usage of each of the five youth gambling products

Frequency	Coin push	Crane grab	Category D fruit machine	National Lottery	Scratchcards
Never	3.4%	6.2%	49.1%	28.4%	31.5%
Rarely	13.1%	30.4%	29.5%	38.5%	34.9%
Occasionally	44.2%	42.7%	16.4%	25.7%	24.4%
Frequently	30.1%	16.4%	3.7%	5.7%	7.4%
Very frequently	9.3%	4.4%	1.3%	1.7%	1.8%



Table 3. Regression models predicting (log+1) PGSI scores by engagement (no/yes) and level of recalled usage on each of the five youth gambling products, 99% confidence intervals

Variable	Statistic	Coin push	Crane grab	Category D fruit machine	National Lottery	Scratchcards
Engagement (ref = no)	Coeff.		0.146	<b>0.261</b>	<b>0.165</b>	<b>0.213</b>
	99% CI		(−0.121, 0.413)	(0.133, 0.389)	(0.022, 0.308)	(0.074, 0.351)
	<i>t</i>		1.41	5.27	2.97	3.96
	<i>P</i>		0.159	<0.001	0.003	<0.001
	<i>n</i>		1,057	1,057	1,057	1,057
Level of usage	Coeff.	<b>0.168</b>	<b>0.209</b>	<b>0.176</b>	<b>0.130</b>	<b>0.176</b>
	99% CI	(0.090, 0.246)	(0.130, 0.288)	(0.050, 0.302)	(0.024, 0.236)	(0.074, 0.278)
	<i>t</i>	5.55	6.80	3.61	3.18	4.45
	<i>P</i>	<0.001	<0.001	<0.001	0.002	<0.001
	<i>n</i>	1,021	991	538	757	724

Note: Dependent variable is PGSI scores (log+1). An alpha of 0.01 was used throughout, hence the 99% confidence intervals. Bold text indicates statistically significant coefficients.

## DISCUSSION

At least 50% of the adult gamblers studied here reported recalling using each gambling product legally while being under the age of 18. All but one of the tested relationships (engagement, crane grab) were statistically significant and in the hypothesized direction. Engagement for crane grab machines (hypothesis 1) was tested but not statistically significant; in part this may be due to 93.8% of the sample having used crane grab machines as children, which limited the size of the comparison group for this hypothesis. This may also be because crane grab machines are the only product out of the five tested that does not yield monetary winnings. The results for levels of recalled usage (hypothesis 2) confirm what was found in an earlier study (Newall et al., 2020). Like the present results, that earlier study also found a statistically significant relationship between recalled scratchcard engagement and adult disordered gambling. However, the present results additionally found statistically significant associations for recalled engagement with the National Lottery and category D fruit machines. The stronger relationships found here may be because the present study only used UK nationals who were also born in the UK. The previous study could have included UK nationals who were born overseas, and whose opportunities to legally use the five products tested here as children would have been more limited.

The present results are subject to the following limitations. The present results are based on a sample of online gamblers. The latest UK Gambling Commission statistics suggest that 21% of UK adults have gambling online in the past four weeks, compared to 47% who have participated in any form of gambling (Gambling Commission, 2020). A replication study, recruiting UK adults irrespective of current gambling status would be best placed to uncover rates of recalled youth gambling engagement across the UK population and their associations with adult gambling. The study only included people born in the UK; this might therefore underestimate effects for people who migrated to the UK as children, given findings of elevated risk of

disordered gambling amongst migrants (Wardle, Bramley, Norrie, & Manthorpe, 2019). The present results feature correlational associations that are not causal effects. These data were collected via a crowdsourcing platform, which is a common data collection method in psychology (Palan & Schitter, 2018), but which have been used less extensively in addiction research (Kim & Hodgins, 2017). The present results are based on retrospective self-reports, which are subject to memory limitations. The maximum age in the present study was set to 40, partly to minimize biases from retrospective self-reports. A prospective study, which measured children's concurrent gambling, and then tracked their gambling behaviour as they became adults, would be best placed to address this limitation (Scott & Alwin, 1998). A prospective study would, however, take time to yield useful results. The present research used a log correction on PGSI score, which is the most common approach in gambling research for addressing the non-normality of this variable (Hing et al., 2019; Turner, Preston, McAvoy, & Gillam, 2013). Future research may also want to consider more complex statistical modelling, such as zero-inflated negative binomial regression models to better account for the distribution of PGSI scores.

The UK government has recently proposed to increase the minimum age of use on National Lottery scratchcards to 18 (DCMS, 2019). But these results suggest that other legal youth gambling products are similar in terms of their associations with adult disordered gambling. The results are also relevant to other jurisdictions, where crane grab machines for example can commonly be found. Legislators in Thailand have recently decided to ban crane grab machines to coincide with their strict ban on gambling outside of horse-racing and the lottery (Pulitzer, 2020).

The present results contribute to a growing literature on childhood exposure to gambling (Delfabbro et al., 2016; Djohari et al., 2019; Molinaro et al., 2018; Pitt et al., 2017; Sharman et al., 2019; Smith et al., 2019).

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**Authors' contribution:** PN drafted the manuscript and performed the statistical analysis. AR provided statistical expertise. SS and LW provided critical edits.

**Conflict of interest:** In the last three years Philip Newall has contributed to research projects funded by GambleAware, Gambling Research Australia, NSW Responsible Gambling Fund, and the Victorian Responsible Gambling Foundation. In 2019 Philip Newall received travel and accommodation funding from the Spanish Federation of Rehabilitated Gamblers. In 2020 Philip Newall received an open access fee grant from Gambling Research Exchange Ontario. Alex Russell has received funding from Victorian Responsible Gambling Foundation; NSW Office of Responsible Gambling; Queensland Justice and Attorney-General; Gambling Research Australia; National Association for Gambling Studies; Australian Communications and Media Authority and the Alberta Gambling Research Institute. From 2014–2016, he provided statistical support for an industry-funded project aimed at evaluating and reducing problem gambling amongst casino employees from Echo/Star Entertainment Group. He is also affiliated with the University of Sydney. He declares no conflicts of interest in relation to this manuscript. Steve Sharman is currently receiving funding from the Society for the Study of Addiction (SSA), and from the National Institute for Health Research (NIHR) Biomedical Research Centre for Mental Health at South London and Maudsley NHS Foundation Trust King's College London. Lukasz Walasek has no interests to declare.

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